



# **Intel® 440MX Mobile Platform Performance Brief**

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## 1. INTRODUCTION

The Intel® 440MX is the first single chipset solution for mobile platforms. Intel® 440MX has been optimized to support the Mobile Pentium® II processor or Celeron™ processor system bus at 66MHz speed, as well as the future release of a 100MHz version to support the Mobile Pentium® III processors. This report only contains the benchmark information for the current 66MHz version.

The Intel® 440MX integrated the traditional 2-chip solution into a single-chip solution. The traditional 2-chip solution is often known as North Bridge and South Bridge. The basic architecture of this chipset comes from the Intel® 440BX and PIIX4E PCIs. The major difference is that 440MX does not support the AGP interface. For a detailed description of other feature differences between 440BX and 440MX chipsets, refer to their specific data sheets on the Intel website. While reducing the total chip count and board real estate to enable low-cost mobile system design, the 440MX delivers the equivalent performance of the 440BX chipset while using PCI graphic controller.

Since 440MX does not support the AGP interface, to really have a fair comparison between 440BX and 440MX chipsets and to focus on the chipset and overall system performance comparison, we have used the same PCI graphic controller for both tested platforms. In addition, we have used the same peripheral devices between the two systems. A list of detailed system configurations is also included in Appendix A.

Another major feature in the 440MX is the AC '97 link interface, which is not supported in the 440BX chipsets. However, this report only provides the Intel's Spectrum of Performance comparison. For specific performance information on the AC '97 soft technology, refer to the "Intel® 440MX AC '97 Power/Performance Application Note" document.

This report contains a comparison of test results from 440BX and 440MX chipsets on Spectrum of Performance for Intel® 300MHz and 366MHz Mobile Celeron™ processors while using PCI graphics controller.

Today's Intel architecture platform performance can be best assessed using the Spectrum of Performance:

- **Productivity Benchmarks** simulate the activities of end users working in typical productivity applications such as word processing, spreadsheets, presentation applications and personal finance programs.
- **Multimedia Benchmarks** are designed specifically to simulate the activities of end users utilizing video, digital sound, PC imaging or video conferencing, and other similar media-rich applications.
- **3D/Floating-Point Benchmarks** measure the performance of three-dimensional visualization techniques such as those used in games to support richer textures and enhanced lighting effects.
- **Internet Technology Benchmarks** evaluate processor Internet performance on browser, 3D, and multimedia technologies.

Representative productivity benchmarks include: Processor-level benchmarks such as CPUmark\*99 and SPECint\*95; and system-level benchmarks such as SYSmark\*98, Winstone\*99.

Representative multimedia benchmarks include: MultimediaMark\*99 from FutureMark\* Corp., Intel MMX™ Technology Applications, as well as Intel Media Benchmark.

Representative 3D/floating-point benchmarks include: the FPU WinMark\* of WinBench\*99 and 3D Winbench\*99 from Ziff-Davis\*, 3DMarkCPU from Futuremark\*, and SPECfp base\*95.

Representative Internet benchmarks include the productivity, 3D, and multimedia benchmarks listed above. Additionally, some Java Internet technology benchmarks are JMark\*2.0 Processor Test for processor level benchmark and SYSmark\*J for the system level.

For more detailed information about the Spectrum of Performance, refer to Intel's website.

- Productivity: Processor level benchmark - SPECint\*95, system level benchmark- Business Winstone\*99
- Multimedia: MultimediaMark\* 99
- 3D/Floating-Point: SPECfp\_base\*95 and WinBench\*99 - FPU WinMark\*
- Internet: JMark\*2.0

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## 2. SPECTRUM OF PERFORMANCE

### 2.1 Productivity Benchmarks

#### Processor Level Benchmark: SPECint\*95

The SPECint\*95 benchmark test provides a comparison point for the performance of the microprocessor, memory architecture and compiler of a computer system on compute-intensive, 32-bit applications. The SPEC benchmark test results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

#### System Level Benchmark: Business Winstone\* 99

Winstone\*99 is a system-level, application-based benchmark developed by Ziff-Davis. Winstone\*99 measures a PC's overall performance when running Windows-based 32-bit applications on Windows\* 98 or Windows\* NT 4.0. It runs real 32-bit business suites through a series of scripted activities and uses the time a PC takes to complete those activities to produce its performance scores. Winstone\*99 includes both high-end suite and business suite tests.

Business Winstone\* 99 incorporates the following popular office software suites: Corel WordPerfect Suite 8, Lotus SmartSuite, and Microsoft Office 97. To mirror the typical usage patterns of today's PC users, the benchmark keeps multiple applications open within each suite, and switches tasks between these applications and the Netscape Navigator Internet browser. (source: Ziff-Davis\*)

### 2.2 3D/Multimedia Benchmarks

The MultimediaMark\*99 is a system-level benchmark from FutureMark\* Corp. that measures audio, video, and imaging performance. MultimediaMark\*99 is a benchmark that focuses on testing multimedia performance of modern PC in a "real world" environment.

### 2.3 Floating-Point Benchmarks

#### SPECfp\*95

The SPECfp\*95 benchmark test provides a comparison point for the performance of the microprocessor, memory architecture, and compiler of a computer system on compute-intensive, 32-bit applications. SPEC benchmark test results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

#### WinBench99\* - FPU WinMark

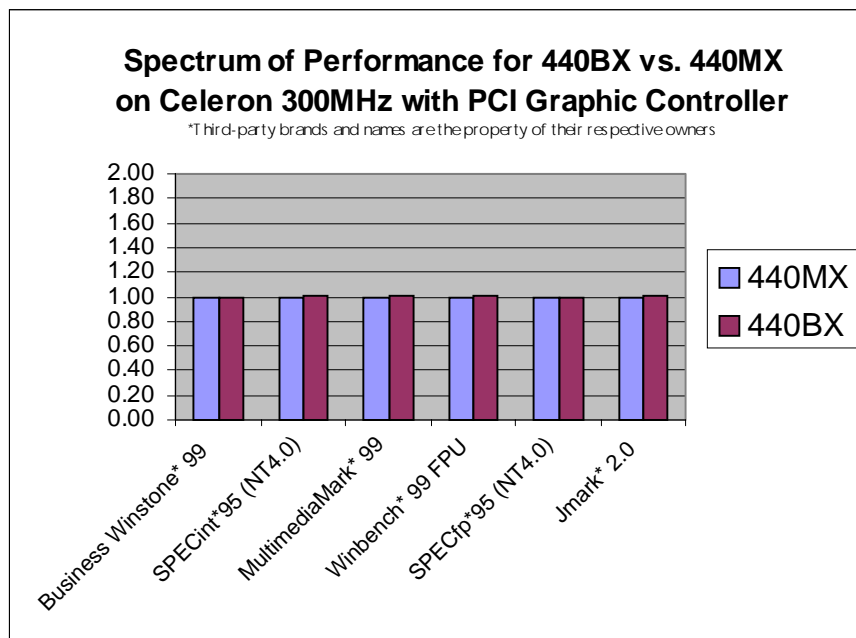
Business WinBench\*99 is a subsystem-level benchmark that measures the performance of a PC's graphics, disk, processor, video, and CD-ROM subsystems in a Windows-based environment. WinBench\*99's tests are all 32-bit and can only run on Windows\*95 and Windows\*NT systems. The FPU WinMark\* components of this benchmark are used for comparing floating-point performance in this report. The WinBench\* 99-FPU WinMark\* benchmark measures the performance of the processor floating-point subsystem, which is used for such tasks as 3D graphics rendering and scientific calculations. This synthetic benchmark was developed by Ziff-Davis\*. The test consists of five algorithms: 3D graphics operations, fast Fourier transforms (FFT), calculation of planetary orbitals, calculation of areas of polygons, and Gauss-Jordan elimination of a coefficient matrix of linear equations. The benchmark reports a single score based on the weightings that Ziff-Davis has assigned to the component algorithms.

## 2.4 Internet Technology Benchmarks

Jmark\* 2.0 is a benchmark developed by Ziff-Davis to measure processor Java performance. The Jmark 2.0 Processor Test stresses the Java Virtual Machine (JVM) on a non-graphical workload.

## 2.5 Summary

As illustrated in Figure 1, the chart below, while running in a 300MHz Celeron™ processor system with a PCI graphic controller, 440MX delivers equivalent performance as the 440BX chipset. This is shown across the Spectrum of Performance benchmarks that we have selected. We ran the benchmarks on the Windows\* 98, except the SPECint95 and SPECfp95 benchmarks, which we ran on NT4.0.



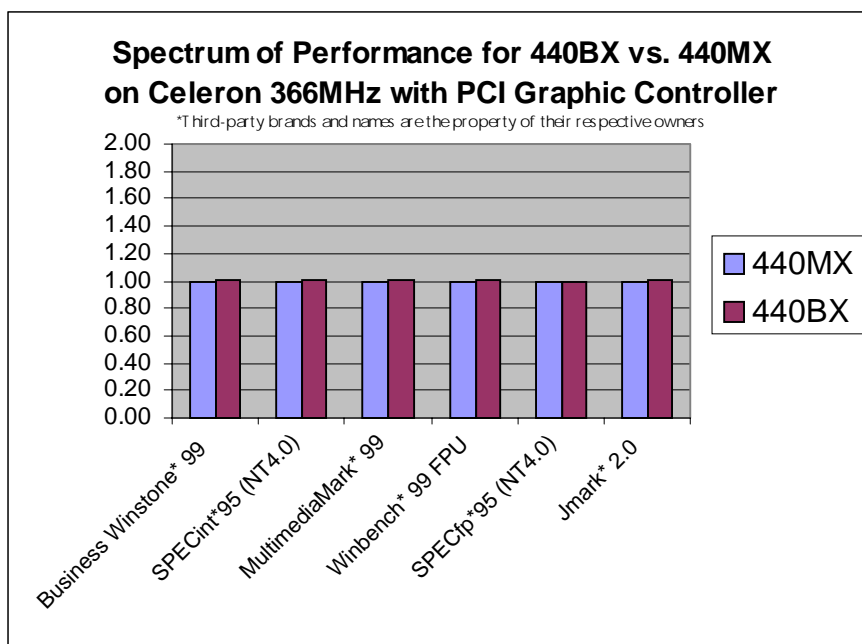
**Figure 1. Spectrum of Performance for 440BX vs. 440MX on 300MHz Celeron™ Processor with PCI Graphics**

Table 1 summarizes the Spectrum of Performance results for the chart discussed above.

**Table 1. 440BX vs. 440MX on 300MHz Mobile Celeron™ Processor with PCI Graphics Benchmark Results**

Processor	Business Winstone* 99	Multimedia Mark* 99	Winbench*99 FPU	SPECint*95	Jmark *2.0	SPECfp95*
440MX Platform with Mobile 300MHz Celeron™ Processor	1.00	1.00	1.00	1.00	1.00	1.00
440BX Platform with Mobile 300MHz Celeron™ Processor	1.00	1.01	1.01	1.01	1.01	1.00

Theoretically, the chipset does affect the peripheral components and overall system performance because of the internal arbitration and buffer structure to effectively distribute the workloads and traffic. Some may be concerned that the overall system performance will suffer from the transition of 440BX to 440MX because of the integration. If we increase the processor performance, this indirectly increases the usage of external bus bandwidth, which also potentially maximizes out the capability of the chipset. To address this concern, we have also run the same benchmarks on the same platform with a 366MHz Celeron™ processor. As illustrated in Figure 2, the chart below, both chipsets still deliver the same performance with increased processor performance while using the same PCI graphic controller.



**Figure 2. Spectrum of Performance for 440BX vs. 440MX on 366MHz Celeron™ Processor with PCI Graphics**

Table 2 summarizes the Spectrum of Benchmark performance results for the chart discussed above.

**Table 2. 440MX vs. 440BX on Mobile 366MHz Celeron™ Processor with PCI Graphics Benchmark Results**

Processor	Business Winstone* 99	Multimedia Mark* 99	Winbench* 99 FPU	SPECint*95	Jmark* 2.0	SPECfp95*
440MX Platform with Mobile 366MHz Celeron™ Processor	1.00	1.00	1.00	1.00	1.00	1.00
440BX Platform with Mobile 366MHz Celeron™ Processor	1.00	1.01	1.00	1.01	1.00	1.00

## APPENDIX A — SYSTEM CONFIGURATIONS

Table 3 shows the systems and their configurations used for evaluating the benchmark performances discussed in this brief.

**Table 3. System Configurations**

System	Intel® 440BX-66MHz Platform	Intel® 440MX-66MHz Platform
<b>Processors</b>	Intel® Mobile Celeron™ processors (300MHz, 333MHz, 366MHz)	Intel® Mobile Celeron™ processors (300MHz, 333MHz, 366MHz)
<b>Motherboard</b>	Intel MHPG internal 440BX motherboard	Intel MHPG internal 440MX motherboard
<b>Host CPU External Bus Speed</b>	66MHz	66MHz
<b>Chipset/speed</b>	Intel® 82440BX-66MHz	Intel® 82440MX-66MHz
<b>BIOS</b>	Phoenix	Phoenix
<b>AMP/ACPI</b>	Disable	Disable
<b>System Memory Size/Speed</b>	64 Mbytes SDRAM (66MHz)	64 Mbytes SDRAM (66MHz)
<b>Motherboard Chip Set</b>	Intel 82440BX	Intel 82440MX
<b>Hard Disk</b>	2.1 GB	2.1 GB
<b>Media</b>	24X CD-ROM	24X CD-ROM
<b>Operating System</b>	Windows 98 for Winstone 99, MultimediaMark and Winbench 99 FPU, Windows NT* 4.0 (OSR3) for SPECint95* and SPECfp95*	Windows 98 for Winstone 99, MultimediaMark and Winbench 99 FPU, Windows NT* 4.0 (OSR3) for SPECint95* and SPECfp95*
<b>Sound</b>	ESS Maestro-2EM	ESS Maestro-2EM
<b>PCI Video Controller</b>	ATI Rage Pro PCI graphics controller (800x600x64)	ATI Rage Pro PCI graphics controller (800x600x64)





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